

Biological Applications of the Principle

One wonders, naturally, what the applications of the concept of hard and soft acids and bases may be in biochemistry and biology. To the extent that biochemistry can be considered to involve simple chemical reactions, many of the applications discussed above can be taken over directly. Unfortunately, most reactions of biological systems are characterized not only by complexity but also by specificity. This means that it is unlikely that general rules will be of much value.

Nevertheless, a few generalizations can be drawn. If the lists of hard and soft acids and bases of Tables 1 and 2 are examined, it is seen that hard acids and bases are usually the normal, abundant components of biological systems. Thus, an organism will tolerate most hard acids or bases, unless some specific reaction occurs. One may say, "La vie est dure."

Contrariwise, most soft acids and bases are poisons to living organisms. While specific effects are no doubt common, the general effect must be poisoning by the formation of complexes with the soft bases and acids

that are present, in small amounts, in the organism—the heavier metals and sulfide groups, for example. It is of interest to find that the same substances that are poisons in heterogeneous catalysis are poisons for living things.

References and Notes

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NEWS AND COMMENT

Daddario Study Says NSF Should Be in Forefront of Policymaking

The National Science Foundation is perhaps the favorite administrative creation of the leadership of American basic science. It is prudent and usually elitist in fulfilling its mandate to support basic research and science education; it is so apolitical that in its 15-year existence its officers have served from administration to administration without ideological strain, and, by design, NSF is generally passive: it waits for proposals, summons panels of scientists to select the most promising, and then parcels out whatever funds are available.

In the prevailing view of the leaders of science, the Foundation could use a great deal more money, and it would be pleasant if it were free of the bit of

congressional tinkering it has encountered. But outside of differences that usually are matters of emphasis rather than substance, the leaders generally approve NSF's administrative style, and particularly its traditional aloofness from political currents and interagency combat. It is safe to say that they would like to see NSF do nothing but expand in its present role of judicious banker of American basic science.

This week, a jarring contrast with this vision was put forth in a study made by Representative Emilio Q. Daddario's subcommittee on Science, Research, and Development, whose parent committee, Science and Astronautics, has jurisdiction over NSF's legislative charter. Titled, "The National Science Founda-

tion, Its Present and Future,"* the Daddario study says, in effect, that it is time for NSF to abandon wallflower tactics, that the Foundation should become a leader in national science policy, and that, while holding to its role in basic research, the Foundation should also focus its efforts on the employment of basic research for the solution of environmental and social problems. In sum, the Daddario committee is telling this carefully conceived, non-truculent creation of basic science that science is too powerful and the Foundation is too important for either to cling to a sheltered position in the governmental structure. The report states:

There should be, and is, a scientific and technological stature about the Foundation sufficient to warrant an extraordinary voice in the science policy of the administration. NSF is the only Federal agency with an

* 118 pages, available without charge from the Committee on Science and Astronautics, U.S. House of Representatives, Washington, D.C. Related documents are: "The National Science Foundation," a report of the Science Policy Division, Library of Congress; and "Government and Science: A Review of the National Science Foundation"; hearings, vols. 1 and 2, also available from the committee.

exclusive scientific mandate. It should make itself heard, and should be listened to, accordingly. . . . It is not clear from the record to date whether the Foundation is yet visualizing and preparing for the dynamic role which circumstances seem to be thrusting upon it. It appears doubtful. . . . It is the subcommittee's belief, with due respect for the merits of keeping basic science in the pure atmosphere of "pursuit of knowledge for its own sake," that science has nonetheless matured a great deal in recent years. We believe it can play in the political leagues without being corrupted or even unduly influenced by the character of the other players.

The subcommittee's specific recommendations for the Foundation are spelled out in a series of legislative proposals which are to be taken up in the new session of Congress, as well as a number of nonlegislative recommendations and observations. But what they all add up to is a design to cast NSF in a role of policy leadership that the Foundation has traditionally avoided. The 1950 Act establishing NSF directed the Foundation to "develop and encourage the pursuit of a national policy for the promotion of basic research" and "to evaluate scientific research programs undertaken by agencies of the Federal government. . . ." Alan T. Waterman, NSF's first director, concluded that it would be ruinous for his fledgling agency to be cast as judge of the work of such research giants as the Atomic Energy Commission and the Defense Department, and he declined to exercise the authority.

In 1962 an executive order transferred the evaluation power to the newly established Office of Science and Technology in the White House; NSF retained authority, as President Kennedy put it, "to originate policy proposals and recommendations concerning the support of basic science," and to provide "studies and information for this purpose," but NSF was, and generally continues to be, uninterested in foraging for difficulties at the national policy level.

In the view of Daddario's committee, "The problem is to reassert and energize the function of the Foundation in creating and shaping a national policy for basic research and science education for the whole Government." To accomplish this it would strengthen NSF's top administration by providing for a deputy director and four assistant directors subject to presidential appointment and congressional confirmation. But, more significantly, it would enhance the role of NSF's top advisory body, the 24-member National Science Board,

so that it would in effect serve as a counterpart of the President's Science Advisory Committee (PSAC). The board, which now ranks in visibility somewhere between the National Monuments Commission and the Joint Committee on the Reduction of Non-Essential Federal Expenditures, should have "a more lubricated and flexible position in governing NSF affairs," says the study. The committee notes that neither PSAC nor the executive branch's sub-cabinet for research, the Federal Council for Science and Technology, "has shown a disposition to work with Congress lacking a specific invitation." And it suggests that, if the Board were relieved of "routine administrative duties," given a small staff, and confined to broad policy questions, there would be encouragement for "both Congress and the Executive Office of the President to make use of the Board as an important added source of capable advice and independent viewpoint." "One can see the Board taking on science resource studies of the kind now handled by PSAC and OST," the report states. "Hence the Board can enable them to turn more of their attention to the applications of science, to scientific research in mission agencies, and

to technology as these affect great national problems." The committee also proposes requiring the Board to make "an annual report on the status and health of science and its various disciplines. . . ."

These cheery portrayals of the Board's potential for service will probably be greeted with some skepticism in the environs of PSAC, where a goodly number of potential recruits have shied away from the schedule of 2 days of meetings per month, plus other duties that bring the total up to a commitment of some 40 days a year. Are there 24 qualified people who would be willing to provide the time and diligence necessary for a performance that would do better than add to the present abundance of confusion in science and government affairs? It's a big country and the ranks of senior and elder statesmen of science are growing, but it is perhaps worth noting that for the past 18 months the State Department has been looking without success for a full-time science adviser. The department, which is in somewhat low repute in the scientific community these days, has been aiming high, and this combination helps to explain failure to fill the position. But, in any case, there is no surfeit of highly qualified candidates for the frustrations of federal science policy and administration.

On the subject of NSF's alleged disposition to permit the incoming mail to determine its allocation of funds, the Daddario study charges that NSF "has not itself put a sustained effort into developing substance, form, and direction of the programs it supports. Once granted its annual budget, NSF has to a large extent followed a practice of waiting for talented outsiders to suggest appropriate projects on which to spend it." What should NSF do that it isn't doing? Among other things, the study suggests that NSF should be responsible for "directing, where indicated, some research—basic or otherwise, and including engineering—to help bring the scientific base for new and emerging technologies required in the national interest to the point where their development can proceed through other federal agencies and industry." Transportation, pollution, water supply, housing, and population were the examples offered. The report also recommended "channeling more effort for the development and refinement of institutions as such, with an eye for special help to those geographical areas presently at the low end of the academic spectrum." The

New FDA Commissioner Named

President Johnson announced Monday that James L. Goddard will become Commissioner of the Food and Drug Administration, succeeding George P. Larrick, who retired last month.

Goddard, 42 years old, is chief of the Public Health Service's Communicable Disease Center in Atlanta, Georgia. He will retain his PHS commission and rank of Assistant Surgeon General in the new post. He will be in charge of an agency with a current budget of \$53 million, a responsibility for regulating the manufacture and sale of foods, drugs, and cosmetics, and a degree of responsibility for regulating agricultural pesticides.

Goddard, a native of Ohio, studied at Washington and Lee and at Temple universities, received his M.D. in 1949 from George Washington University, and the degree of master of public health in 1955 from Harvard.—M.K.Z.

report notes that NSF has had budgetary disappointments in the past, and that it needs the "understanding and active support of Congress" if it is to expand its programs. But it goes on to suggest that the Foundation itself may be responsible for some of its congressional travail.

Past refusal to vote the requested budgets, the study states, partially "reflects the failure of the Foundation and the Chief Executive to inform the Congress early enough, or to present new ideas with sufficient clarity and emphasis." Aggressiveness can provoke criticism, the subcommittee conceded, but new ideas cannot be accepted unless they are proposed. "The rigors of the political process being what they are," the report advised, "the Foundation might profitably show more aggressiveness in the future."

Is NSF cut out for the role conceived by its legislative overseer? Daddario, it should be noted, is friendly to NSF, and his prescription derives from an appreciation of NSF's importance to the scientific community and a desire to increase the agency's usefulness. Nevertheless, there are some troublesome issues of policy and politics implicit in the Daddario proposals. NSF was explicitly conceived on the assumption that, amidst the clamor of competing demands for federal funds, it would be desirable to have one agency whose sole objective would be the long-term health of basic research. The intention was not to disengage basic science from the political process; rather it was to recognize that, if scientific capabilities are to be available to serve the political process, they must be permitted to evolve and mature in an atmosphere free of political turbulence and strife. Without a constituency that is prepared to back it up with political support, NSF has had to subsist on goodwill and reason in its efforts to support basic research. Should it now abandon its traditionally sheltered position and aspire to the leadership role set forth by Daddario? If so, when it gets into trouble, to whom should it turn? Its clients in the scientific community generally raise their voices about NSF only when they have complaints. And in Congress few members know or care about NSF, which fact may be partially NSF's fault. But the way to a congressman's heart is through money or service for his district, and it's hard to reconcile that game with a mandate to promote high-quality basic research.

—D. S. GREENBERG

Indirect Costs: New System Going into Effect

When research is conducted, one of its by-products is "indirect costs"—expenses such as light, heat, administration, and library services—which are necessarily incurred but difficult to charge off with any precision to a specific research project. Since most universities face difficult budgetary problems, fervent study has gone into the question of whether federal research grants may actually cost more than they bring in. Inevitably, the conclusion is that they do, but, since university bookkeeping is often a blend of astrology and arithmetic, it is hard to know who should pay for what on campus. Furthermore, Congress has long felt that a grant is a gift, and it is understandably puzzled by institutions clamoring and scheming for grants that are supposed to be financially oppressive. As a consequence, statutory limitations were placed on the amounts that federal agencies might pay for indirect costs associated with their research grants. In recent years, the limitations have risen from 15 to 20 percent of the direct costs, but the universities continue to argue that indirect costs actually average from 28 to 32 percent, depending on the size of the institution and the nature of the research.

Last year, the complaints became sufficiently loud for Congress to reassess the problem, and, as a result, a new system is to go into effect by 1 March. Known as "cost sharing," it is based on the principle that the university should pay something toward the cost of federally sponsored research, but just how much is something to be worked out between the institution and the granting agency. The guidelines for working this out are contained in a Bureau of the Budget paper titled "Circular No. A-74," which maintains the high standards of opacity established by its predecessor, "Circular No. A-21."

"A higher degree of cost participation (by the university) should ordinarily, exist," the new directive states, "when the cost of the research consists primarily of the efforts of senior faculty during the academic year, or when the grantee institution's long range interests are best served by substantial cost participation." On the other hand, the directive states that "Cost participation should generally be lower when a major portion of the research cost consists of equipment, when the grant provides for a large component of services to be made available on a regional or national basis, or when in the view of a Federal agency an area of research requires special stimulus in the national interest."

The directive states that cost sharing is to be done on "more than a token basis," but it offers no figures. Agency officials note that in congressional discussion of the method, the figures of 1 to 5 percent of total cost were mentioned as proper shares for the grantees, but at this point no one can say just how the cost sharing will work out. The real question is, of course, will this method bring more money into the tills of American universities. One National Science Foundation official said he didn't think so. A member of the White House advisory staff thought otherwise, particularly in the case of universities that have not been going as far as they might in charging faculty salaries to research funds.

In any case, A-74 is sufficiently abstruse to warrant the convening of a conference of accountants and theologians. It clearly can mean whatever the agencies want it to mean, and, since the agencies are sympathetic to the financial plight of the nation's universities, the inclination will probably be to interpret it generously. But whether the funds will be there to support this inclination is something that we will not know until the new budget is made public and is finally acted upon by Congress.—D.S.G.